

THE BULLETIN

OF THE

Pictou Academy

...Scientific Association...

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THE Pictou Academy Scientific Association was instituted in 1882 and during the earlier years of its existence much valuable work was done by the various clubs of which it was composed, in making collections of the local fauna and flora and in stimulating interest among the students of the institution in Scientific work. These collections have been largely preserved in the Museum of the Academy and have been added to from time to time since. In later years, however, the laboratory classes to a great extent usurped the place of the old working clubs and the Scientific Association ceased to be a factor in the life of the Academy as a working organization. During the past session it was re-organized and in order that a record might be had of any work done by its members which might be of more general and permanent interest it was decided to publish bulletins from time to time, in which the results of such work might be preserved. The present number is the second of such publications.

Membership in the Association is open to all Academy students and alumni and to others, as associate members, who are interested in the work of the institution. A nominal fee of fifty cents per annum is exacted of members who wish to receive copies of the Bulletin as issued.

The officers for the current year are :

Hon. President:—R. MacLellan.

President—C. L. Moore.

Vice-President—A. G. Baillie.

Sec'y-Treas.—H. F. Munro.

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"RUSTS,"—with notes on some Nova Scotian Species.

By C. L. MOORE, B. A.



THE Uredineae (Rust fungi) are a group of fungi, parasitic on the higher plants to which they frequently prove very injurious. The spores breaking through the epidermis of various parts of the host plants, produce in many cases the characteristic rust spots which have given to the group the common name of the Rusts. These spores arise from a mycelium, the vegetative part of the parasite, which in the form of branching filamentous hyphae, grows in the intercellular spaces of the host plants and absorbs its nourishment from the surrounding cells. The forms which occur on grains, as wheat and oats, are the most generally known and a sketch of the life history of one of these will serve to illustrate that which is common to a large number of the group. One of the species infecting the grains is *Puccinia graminis*.

For a long time Barberry bushes were popularly supposed to be harmful to wheat fields, and in 1865 De Bary set to work to investigate this belief. It was in this connection that he worked out the life history of this species. In May or June in countries where the barberry grows, spots appear on the leaves of the tree and in these are developed the cup-like developmental stage of the fungus—the cluster-cup stage. In the formation of these one thread of the mass of hyphae, growing in the intercellular spaces of the leaf, swells up and gives rise to a large number of branches which become the spore bearing threads.

The spores are formed basipetally by the construction from these. The first cell cut off from the tip of each thread does not become a functional spore, nor do any of the cells of the outer rows, but these, closely appressed together form a complete envelope around and above the true spores and constitute what is known as the peridium. All this development takes place within the tissue of the host, but finally by continued growth the epidermis is burst aside and the top of the peridium is also broken and thrown back. Thus are formed the little cups filled with chains of spores from which this stage of the fungus takes its name. In connection with the formation of these cluster-cups one may also find on the Barberry leaves, on the opposite sides, peculiar flask shaped structures from the cavities of which there radiate a great number of simple unbranched hyphae from the tip of each of which a small spore is cut off. These are the pycnidia and the spores are known as pycnosporos. The cluster-cup spores, or aecidiospores, germinate promptly but they are not capable of infecting a Barberry plant. They must germinate on a grass plant and when they do this they send their germ tubes into the

tissue of the leaf or leaf sheath, and give rise to a mycelium of branched filamentous hyphae in the intercellular spaces of the grass. After this is well developed a large number of threads push up together towards the surface. Swelling at their tips and growing towards the stomata grooves they throw aside the epidermis. The spores formed from the enlarged tips of these branches are now mature and of a brownish or orange color. It is this spore form which has given the name "rust" family to the group. This is the red rust or *Uredo* spore form. These spores are thin walled and capable of germinating directly and infecting new grass or grain plants. The walls are covered with wart-like protuberances and each spore is provided with a number of germ pores through which the germ tubes grow out. They are sometimes known as the summer spores. Each sorus of spores which arises from infection by a uredospore is exactly like that arising from an aecidiospore. Later in the season, in the very same sori, one may find the threads producing another kind of spore,—the winter, or resting or teleutospores, formed in the species under consideration, in pairs. These spores are thick walled and after a period of rest, normally through the winter, they germinate, not producing a mycelium capable of infecting a new plant, but fructively. The germ tube which arises from one of these spores is cut up into four cells by cross walls and from each of these four cells a slender outgrowth arises at the tip of which a spore is developed. These spores are known as the basidiospores and when they germinate they attack, not a grass, but the proper host plant—the Barberry. The mycelium here produced gives rise to cluster-cups and pycnidia and the life cycle is complete. There are thus five spore forms in this life history,—pycnospores, Aecidiospores, Uredospores, Teleutospores and Basidiospores, and each, except the Uredospores, produces the next spore form in the cycle.

In the group we find multitudinous variations of this typical complete life cycle. Certain species produce only basidiospores, from germinating teleutospores, or, in addition to teleutospores, only uredospores are developed on the same host. In fact rusts are known which have the teleutospore form with any one, two, three or four other spore forms making numerous variations.

The circumstance that different stages of the same rust, as in the case of grain rust, are developed in different hosts considerably complicates the study of the life histories of the different members of the group as the connection between a cluster-cup or aecidia stage on one host and a teleutospore or Uredospore stage on another cannot be recognized without careful research.

The question may suggest itself as to how it happens that *Puccinia graminis*, one of our common grain rusts, appears year after year in districts such as our own where the Barberry tree is practically unknown—this tree being essential to the completion of its life cycle. In such circumstances the new infection of the grain in the spring appears to come from Uredospores which have survived the winter.

Following is an annotated list of a number of rusts collected in the vicinity of Pictou during 1905-6. With two or three exceptions they are all new to the flora of Nova Scotia.

1. **Puccinia Circaeae**, *Pers.* On *Circaea alpina*. The sori are arranged more or less regularly in circles on discolored spots on the leaves.
2. **Puccinia acuminata**, *Peck*. The sori form cushion-like, dark purple spots on the under sides of the leaves of *Cornus canadensis*. On the upper side a corresponding depression marks the position of the sorus.
3. **Puccinia cicutae** *Lasch.* On *Cicuta maculata*.
4. **Puccinia taraxaci**, *Plow.* On *Taraxacum Officinale*.
5. **Puccinia suaveolens** (*Pers.*) *Roste.* Appears throughout spring and summer on the under side of the leaves and on the stems of the Canada thistle. Afflicted plants appear to very rarely mature seed.
6. **Puccinia violae**, (*Schum.*) **DC.** On *Viola blanda* and *V. cucullata*.
7. **Puccinia coronata** *Cda.* Throughout the seasons of 1905 and 1906 this appears to have been the common rust affecting oats in the vicinity of Pictou.
8. **Puccinia sessilis**, *Perse* (?) On *Maianthemum canadense*.
9. **Puccinia menthae** **P.** On *Mentha canadensis*.
10. **Puccinia graminis**, *Pers.* On wheat and oats.
11. **Uromyces caladii**, (*Schwein.*) **Farl.** On *Arisaema triphyllum*.
12. **Uromyces trifolii**, (*Hedw.*) **Lev.** On *Trifolium pratense* and *T. repens*.
13. **Pucciniastrum agrimoniae** (*De.*) **Diet.** On *Agrimonia eupatoria*.
14. **Phragmidium subcorticum** (*Schrank*). On *Rosa blanda*, sori breaking through the epidermis of the leaf petioles, leaves, and calyx in orange colored masses.
15. **Triphragmium clavellosum**, *Peck.* On leaves of *Aralia nudicaulis* giving the leaves a much blotched spotted appearance. Previously reported only at considerable altitudes, but at Pictou occurring in localities little above sea level.
16. **Gymnoconia interstitialis**, (*Schlecht.*) **Lagerh.** Sori form orange colored confluent patches on the under side of the leaves of *Rubus strigosus*.
17. **Coleosporium Solidaginis**, (*Schw.*) **Thum.** On *Aster patens*.
18. **Melampsora Medusae**, **Thum.** On leaves of *Populus grandidentata*. The areas surrounding the sori become almost coal black in color early in autumn.
19. **Peridermium balsameum**, *Peck.* The aecia are white, arranged in two irregular rows on the under side of the leaves. The whole leaf takes on a bleached appearance. I have only found this species occurring at considerable altitudes.
20. **Peridermium decolorans**, *Peck* On *Picea rubra*.
21. **Peridermium elatinum**, (*A. & S.*) **K. & S.** On *Abies balsamea* causing the formation of "witches' brooms."

The nomenclature of host plants is that of Gray's Manual 6th Ed.

BOG PLANTS.

A. G. Baillie. ('06).

The subject of this article was assigned to me by the President of the P. A. Scientific Association. I certainly would never have chosen it myself: yet in spite of wading through the cold water, in spite of the blood-thirsty mosquito, I found many things which interested me very much. My only regret is that I could not spend as much time on the subject as it deserved.

I confined myself mostly to a bog lying about two miles north of the Academy. This being one of the "raised" bogs presents some peculiarities in itself, which some other member might find interesting and quite worthy of separate investigation. It is situated in the woods which lie between Pictou and Carribou and its outflow finds its way to the stream which flows over Barry's Falls. At the side opposite to the outlet extends a sand beach nearly the whole length of the bog. This would show that at some time the surface of the bog was covered with water to some depth. If not, whence the beach? Whether that water was fresh or salt remains to be disclosed. The middle part of the bog is raised, I should judge, to the height of six or eight feet.

The substratum penetrated by the roots of most bog plants has a temperature below that favorable to absorption by the plant, consequently there are several means adopted by Nature to overcome this difficulty and to cause a decrease of transpiration. Some peculiarities are noticeable to the naked eye, others need the aid of a microscope.

Among the characteristics of bog plants the most noticeable are:—

1. A reduction in size of leaf, leaving less surface for transpiration.
2. The outside covering of the plant comprises a coating of wax and hairs, filled with very minute air cells.
3. The epidermal and hypodermal tissues are thick walled.
4. A difference in the shape of leaves from those found in dry places. The leaves of bog plants are nearly all revolute.
5. The roots of bog plants are longer than those of corresponding plants in dry positions.

The following list of bog plants which are found in this County, as well as in other parts of the province, will, perhaps, interest the beginner more than some others:—

1. **Ledum latifolium**. L. (*Labrador Tea*). Found very abundantly. The woolly leaf is particularly adapted to this kind of life.
2. **Vaccinium corombosum**, L. (*Swamp Blueberry*). This plant resembles *Vacc. Penn.*, but is taller and berries ripen later. Common in N. S. bogs.
3. **Andromeda polifolia**, L. Is a hardy shrub quite common in our bogs.

4. **Chiogenes hipsidula**, Salisb, (*Creeping Snowberry*). Trailing over an occasional knoll adds some attraction to the dismal bog.

5. **Sarracenia purpurea**, L. (*Pitcher Plant*). Is too well known to most of us to need more than passing notice; but those who have not made a careful study of this plant should do so at the first opportunity.

6. **Vaccinium oxycoccus**, L., and **Vacc. macrocarpon** Ait. The small and the large cranberries are found in all our bogs. The former is commonly called the "bogberry."

7. **Rubus Chamaemorus**, L. (*Bake Apple*). This beautiful plant grows in all our bogs. Its berry rivals that of the cranberry. Its flower is only seen for a few days in the middle of June.

8. **Geum rivale**, L. (*Purple Avens*). Is commonly called the "Chocolate Flower" in many localities. It is one of our most interesting plants, and common all over the province.

9. **Impatiens fulva** Nutt. (*Touch-Me-Not*). Is a plant whose spotted sickly looking flower looks quite at home in its unhealthy surroundings; but it is found near the edge of the bog.

10. **Eriophorum vaginatum**, L. The cotton-like tufts of this plant are quite conspicuous in all our bogs.

11. **Typha latifolia**, L. (*Cat-tail Flag*). With its spike having the upper flowers staminate and the lower ones pistillate, looms up conspicuous in our bogs.

Directly on the surface of the bog will be found a dense matting consisting of *vermicularia*, sphagnum and *cladonia*; while in the central part of the raised bog where the surface is more dry may be found reindeer moss. All the other plants grow up through this matting. Here and there stand a few sickly looking spruce, birch and juniper, whose scanty, dwarfed leaves proclaim them out of their natural habitation.

This article is not intended as a list of bog plants; but I have mentioned those which best show the characteristic features of bog life. Should any student or member of this society ever make a study of plants of this kind I can assure him of an interesting study, and would like to see the result of his labours in the pages of the Bulletin.

THE MOLLUSKS OF PICTOU COUNTY.

A. R. Campbell. ('06).

After the re-organization of the Pictou Academy Scientific Association in the term of 1905-6, each of the Scientific "A" students was given some particular branch of the Pictou Co. fauna or flora for special study. To me was assigned the sub-kingdom Mollusca. On my daily walks during the remainder of the term I collected specimens along the western shore of Pictou Harbour and throughout part of the summer vacation I studied the Mollusca of Merigomish Harbour and the country round about the eastern part of it. The following list could be greatly lengthened by a more thorough study of even this limited area, and I know of numbers of Mollusca found in other parts of the county that are not found in the parts above mentioned. The classification and nomenclature is that used by Dr. Gould in his "Invertebrata of Massachusetts."

CLASS, GASTEROPODA.—SUB-CLASS PULMONIFERA.

1. *Helix albolabris*.—Large land snail; not very common.
2. *Helix striatella*.—Common under decayed logs.
3. *Succinea obliqua*.—Common. May often be found dead on the ties where the railway passes through swamps, having been killed by the sun's heat.
4. *Physa heterostrophia*.—Found dead specimens in W. T. Irving's mill-dam, French River.
5. *Hyalina arborea*.—Very common under stones and decayed logs in the woods.
6. *Hyalina chersina*.—Not common. Found in deep woods.
7. *Hyalina indentata*.—Common. Found in company with *H. arborea*.
8. *Hyalina milium*.—Not common. Found under decayed wood and stones.
9. *Limax agrestus*.—Common "slug." Found in damp places about all buildings.
10. *Limax campestris*.—Common.
11. *Tebennophorus dorsalis*.—Dies in about 15 minutes when exposed to the dry air. Found under stones in the woods and in cellars.

SUB-CLASS—PROSOBRANCHIATA.

12. *Crepidula fornicata*.—Common in Northumberland Strait.
13. *Crepidula plana*.—May be found abundantly in old shells of *L. heros* taken up in lobster traps.
14. *Littorina littorea*.—Very common on all coasts.

15. *Littorina paliata*.—Common in the harbours.
16. *Littorina tenebrosa*.—Common on wharves and in marshes.
17. *Littorina rudis*.—Not very common. In harbours.
18. *Nassa obsoleta*.—Very common.
19. *Lunatia heros*.—Common "Sand collar Snail."
20. *Lunatia triseriata*.—Common. Is considered to be the young of *L. heros*. I have one shell 15-16 of an inch in length.
21. *Lunatia groenlandica*.—Not common.
22. *Tectura alveus*.—Common on eel-grass in harbours.
23. *Purpura lapillus*.—Found on the rocky shore at the back of Big Island.
24. *Lacuna vineta*.—Rare.
25. *Bella cancellata*.—Not very common.
26. *Bittium nigrum*.—Abundant on *Fucus* and other seaweed in harbours.
27. *Odostomia seminuda*.—Found clinging to other shells and rocks.
28. *Rissoa latior*.—Found on harbour flats and sheltered rocks.
29. *Skena planorbis*.—Found clinging to seaweed at mouth of Pictou Harbour.

CLASS, CONCHIFERA.

30. *Solen*ensis*.—Found on the flats in harbours.
31. *Venus mercenaria*.—Found in considerable numbers near low water mark in harbors.
32. *Mya arenaria*.—Common clam. Very abundant.
33. *Mytilus edulis*.—Also very abundant. In Merigomish Harbour is a place called the Mussel bed where the mud is so full of the Mussel shells that it is dredged out in the winter and used for fertilizing.
34. *Modiola plicatula*.—Common in marshes and on rocks.
35. *Modiola modiolus*.—"Great Horse Mussel." Common.
36. *Ostrea virginica*.—Oyster. Common.
37. *Mactra ovalis*.—Common on shore of Northumberland Strait.
38. *Mactra solidissima*.—Found on shore of Northumberland Strait. Not very common.
39. *Pecten tenuicostatus*.—Scallop. Found on Gulf Shore. Not common.
40. *Macoma fusca*.—Common in our harbours.



